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**Deblistering machine**

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FIG. 1.

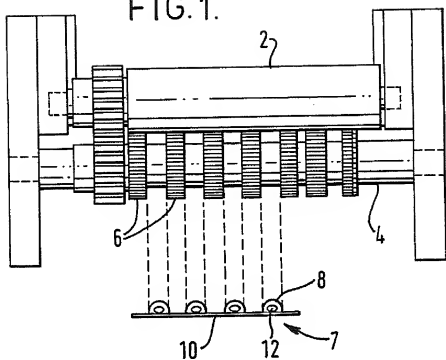
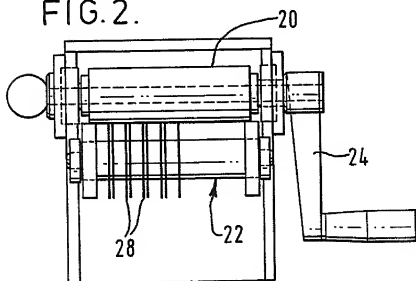


FIG. 2.



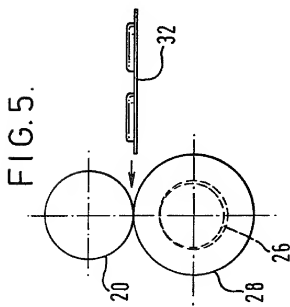
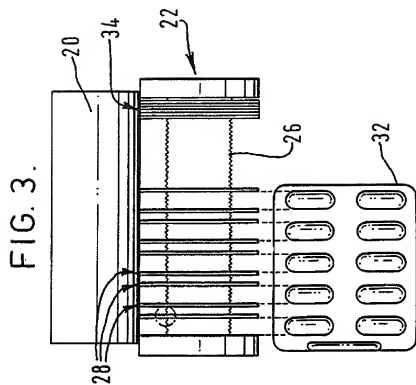


FIG. 6.

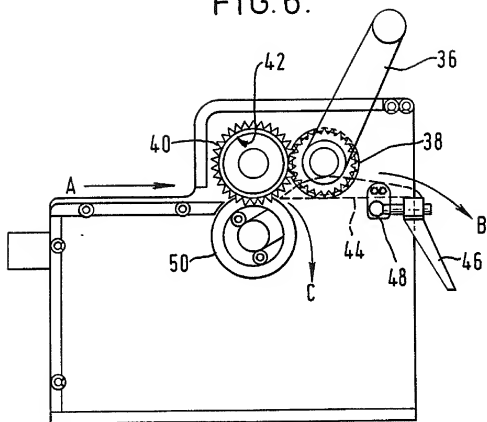
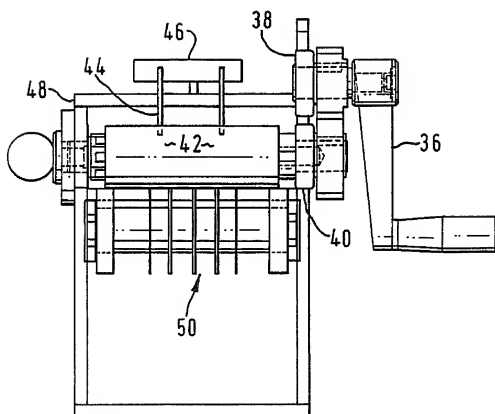


FIG. 7.



## DEBLISTERING MACHINE

This invention relates to a deblistering machine.

Blister packs are a very common form of safely and conveniently packaging and selling pharmaceutical tablets. Such packs generally comprise one surface having a series of aligned wells into which the tablets are located, and a second flat surface sealing the open well sides.

Extraction of the tablets prior to human use, generally termed "deblistering", is done for two main reasons. Either the blister pack is imperfect in some way, and is not therefore vendible, whilst the tablets are still reusable, or it is desired to select only a certain number of tablets for a particular prescription. It is now common in some institutions, e.g. nursing homes, for the staff to desire that the individual dosages for their patients are made up ready for prescribing. Some prescriptions may comprise a number of different tablets for different purposes.

Tablets can come in a wide variety of shapes and sizes, and come from different companies. Hence blister packs housing tablets have a wide variety of patterns of different widths, lengths, and well separations.

Deblistering packs by hand is time consuming, stressful and also unhygienic. Various forms of deblistering machines have been made, and one form comprises top and bottom rollers through which the blister pack passes and the pressure from which forces the tablets out. Because of the secure nature of the seal between the surfaces of the pack, to prevent contamination and possibly to prevent opening by children, the bottom roller generally provides edges which align with the sides of the tablet wells, and which thereby provide a firm inter-well hold whilst the top roller forces the tablet out of the wells between the bottom roller edges.

The bottom roller of such a prior art machine can have a number of thick lands with edges. The thickness of the lands generally corresponds with one or a standard inter-well distance, and one or more of the lands is moveable along the spindle for alignment with each different blister pack. For this, the lands are secured  
5 in place by intervening collars or nuts, each land and collar or nut requiring time and effort for alignment, placement and securement. Where a prescription may require only a few tablets from a number of different sized blister packs, the time and effort for each alignment becomes a significant burden.

EP 059638A describes a deblistering machine having a bottom roller with a  
10 moveable collar with two lands. However, this machine is adjustable to fit only a few sizes of blister packs, and provides only one inter-land (and thus inter-well) adjustment.

An object of the present invention is to provide a more versatile deblistering machine with easier adjustment.

15 According to one aspect of the present invention, there is provided an apparatus for extracting articles from a blister pack comprising first and second opposing rollers between which the pack is able to pass for article extraction through pressure from the rollers, wherein the first roller is wholly or substantially cylindrical, and the second roller comprises a shaft having a plurality of transverse discs  
20 therearound, the discs being separately moveable along the shaft, characterised in that the discs are not locked axially of the roller in use.

The discs meet and support the sides of the wells holding the articles in a similar manner to the edges of the lands in prior art machines, thereby to allow pressure extraction by the other roller. However, because the discs are separate, they can be aligned as desired or necessary to fit any blister pack configuration. The  
25 discs are also easily moveable and locatable along the shaft for realignment.

The first roller or the second roller could be static, with the other roller drawing the blister pack between them. Preferably, both rollers are rotatable.

The discs may be inherently able to maintain their alignment during use due to their shape and design and/or the shape and design of the shaft. Preferably, their alignment is maintained during use either by external pressure thereon, such as from the first roller meeting the discs, or by internal pressure thereon, i.e. from the shaft of the second roller, having a changeable size.

In one embodiment, the shaft may be a wholly or substantially smooth cylinder, with the discs being relatively tight fitting thereabouts. Once the discs are aligned as required, e.g. by using a template with set slots or blocks according to the inter-well distances of the relevant pack, external pressure from the first roller on the discs could maintain the discs in alignment in use.

In an alternative embodiment, the shaft could comprise two or more parallel elongate parts, e.g. quarter shaft segments, moveable between a contracted position and an expanded position. In the contracted position, the parts have a reduced or zero inter-part distance, so as to provide freedom of transverse movement of the discs along the shaft during realignment. Once the discs have been aligned as required, again possibly using a template as described above, the shaft parts are moved to their expanded position to engage the inner circumferences of the discs and provide internal pressure thereon, which pressure is able to hold the discs in position either solely or sufficiently prior to engagement of the discs with the first roller.

One or more of such parts could include grooves or ridges to assist location of the discs once aligned. The parts could also be biased to provide rapid and/or permanent biasing of the parts to their expanded position.

In a further alternative embodiment, the shaft comprises a cylindrical spindle having a plurality of partly or fully circumferential grooves therealong, each disc being locatable in one or more grooves. The spindle could have any number of grooves. The grooves could extend partly or fully around the circumference of the



spindle. The grooves may be separate so as to be discrete, or be continuous along the spindle. Preferably, the grooves allow for accurate disc placement within possibly a desired tolerance. The grooves are preferably relatively shallow to allow easy movement of the discs along the spindle during realignment. Whilst the discs could be locatable in grooves, external pressure of the first roller on the discs of the second roller during use preferably assists their securement and thus continuing alignment during use.

The number and width of the discs may be as desired or necessary. Where the discs are thicker than any grooves used, the discs can be locatable in a number of grooves, e.g. two or three. The discs could taper from their inner surface to their circumference.

Whilst it is generally intended that each disc provides one edge to meet one well side, some or all of the discs could have an inter-well thickness, i.e. providing two edges for parallel wells, similar to the lands of prior art machines. Preferably however, the discs are wholly or substantially flat, to increase the number and range of alignments possible.

The first roller is wholly or substantially cylindrical so as to provide a substantial or continuous meeting surface for the discs of the second roller wherever the discs are located along the second roller. The rollers are preferably moveable between an engaged position where they meet for use, and a disengaged non-use position where the discs are moveable.

The rollers and discs could be made from any suitable material, generally metal or plastic. The shaft could be made from an impressionable material such as polypropylene, such that pressure from the first roller makes the discs form grooves in the shaft to help locate and secure the discs on the shaft in that alignment pattern. The shaft of the second roller could be machineable, e.g. to allow grooves to be formed thereon. The discs are preferably a hard and tough material, e.g.

stainless steel. The first roller could be formed from a more flexible material which allows firm engagement with the edges of the discs, but room also for the blister pack thereinbetween.

The discs could be loose or relatively tight fitting on the shaft, possibly  
5 depending upon the nature of the shaft. The discs preferably have rapid movement along the shaft for quick realignment.

The apparatus could include a blister pack guide feeding means to guide the pack towards the rollers and provide correct alignment of the pack with the discs. The apparatus may also include a disc alignment means as a template to assist  
10 alignment of the discs with each different pack and/or the pack feeding means.

Whilst the present invention is particularly suitable for manual use, where rapid and frequent adjustments are usually required for small scale prescriptive requirements from different shaped blister packs, the apparatus could also be used on a large scale, e.g. automatic deblistering machines, generally used to remove  
15 tablets from defective packs after production line assembly.

The apparatus could also include more than one first or second roller to provide more certain deblistering in a multi-stage process, or multiple parallel simultaneous deblistering. The apparatus could also include one or more post deblistering guide means to assist division of the separated articles and the empty  
20 deblistered packs into desired locations, i.e. into different collecting trays or bins.

The apparatus of the present invention also generally includes means to rotate one or both rollers, either manually or automatically. One general manual means is a handle, either coaxial with one of the rollers, or with a drive means to one of the rollers. The drive means could include one or more gears to help easy  
25 rotation of the handle. Automatic means includes electric, fluid or other means such as a motor, possibly with a trip switch organised to work only on the presence of a blister pack. Whilst each roller could have a drive means, generally the pressure

between the two rollers in the engaged position is sufficient for the rotation of one roller to rotate the other roller appropriately.

Articles which can be held in a blister pack and which can be removed by the present invention include any solid walled articles sold in a pharmaceutical dosage  
 5 form including caplets and capsules, and most usually tablets.

According to a second aspect of the present invention, there is provided a method of extruding articles from a blister pack wherein the pack is passed between first and second opposing rollers, the first roller being wholly or substantially  
 10 cylindrical, and the second roller comprising a shaft having a plurality of transverse discs therealong, the discs being separately moveable along the shaft and aligned to meet and support the sides of the wells of the pack to allow pressure extraction of the articles by the first roller, characterised in that the discs are not locked axially of the roller  
 in use.

Embodiments of the present invention will now be described by way of example only and with reference to the accompanying diagrammatic drawings in  
 15 which:-

Fig. 1 is a front view of the rollers of a prior art deblistering apparatus and an aligned blister pack;

Fig. 2 is a front view of a first apparatus according to the present invention;

Fig 3 is a simplified front view of the rollers in the apparatus in Fig. 2 with a  
 20 plan view of an aligned blister pack;

Fig. 4 is an enlargement of a part of the edge of the spindle and disc in Fig. 3;

Fig. 5 is a side view of the rollers in Fig. 3 and a blister pack;

Fig. 6 is a simplified side cross-sectional view of a second apparatus  
 according to the present invention; and

25 Fig. 7 is a plan view of the apparatus in Fig. 6.

Referring to the drawings, Fig. 1 shows the upper and lower rollers, 2,4 respectively, of a prior art deblistering machine. The lower roller 4 has a series of

fixed lands 6 therealong at fixed intervals. Also shown in Fig. 1 is a side view of a typical blister pack, having a top surface with a series of wells 8, and a flat bottom surface 10, together enclosing a number of tablets 12. The edges of the lands 6 are aligned with the edges of the wells 8 so as to hold those edges whilst the upper roller 2 pressures the tops of the wells 8 to force the tablets 12 through the bottom surface 10 and out to a collection facility. However, the fixed lands 6 provide no flexibility for different sized and patterned blister packs.

Fig. 2 shows a deblistering apparatus according to one embodiment of the present invention. The apparatus comprises first and second opposing rollers, 20, 22 respectively. The first roller 20 is cylindrical, and is formed from polyurethane. It is rotatable by a handle 24. Rotation of the first roller 20 will cause rotation of the second roller 22 therewith due to the pressure therebetween. Alternatively, or in addition, the rollers 20, 22 may be connected e.g. by cogs to confirm connected and co-ordinated movement.

As shown in greater detail in Figs. 3 and 4, the second roller 22 comprises a spindle 26 and a number of separate discs 28. The circumference of the spindle 26 has a continuous series of annular grooves 30 along it. The width of the grooves provides the accuracy of placement and alignment of the discs 28, and accuracy is very important in deblistering. If the edges of the discs are too close or tight relative to the tablet, the tablet will be damaged and so subsequently unusable or resellable. If the edges are too far apart or loose, there may be no extraction of the tablet as the well is allowed too much deformation without breaking. The grooves 30 on the spindle 26 of the present invention could have a width as low as 1mm.

The discs 28 have a central bore which is slightly greater than the diameter of the spindle 26, such that they are moveable therealong. However, the inner surface of the disc bore allows it to locate in a groove 30, as shown in Fig. 4, and thus rest in

a desired aligned position. The second roller 22 and discs 28 are made of stainless steel.

The first or second roller 20, 22 is preferably moveable between an engaged position with the other roller and a disengaged position. In the engaged position, the pressure of the first roller 20 on the edges of the discs 28 is able to maintain the discs 28 in the desired grooves 30 during operation of the apparatus. In the disengaged position, the discs 28 are freely moveable along the second roller 22. In Fig. 3, the spindle 26 has a number of spare discs 34 ready for additional use when required.

In use, the rollers 20, 22 are disengaged so that the discs 28 can be moved along the second roller 22 to be aligned with the edges of the wells of a blister pack 32 to be opened. Whilst the positions of the discs 28 could be judged by the eye, preferably an alignment means such as a slotted template could be used. A template could be created for every size and pattern of blister pack to be deblistered, or at least the main ones. The template would readily show where the discs 28 should be located and spaced along the spindle 26. Once the discs 28 have been set up, engagement of the first roller 20 secures the discs 28 in their relevant grooves 30. The blister pack 32 can then be passed through the rollers 20, 22 (as shown in Fig. 5), and the tablets extracted by the pressure of the first roller 20 against the edges of the well sides, supported by the discs 28.

After extraction from one type of blister pack, realignment of the discs 28 for another type of blister pack is a very quick and simple operation. The rollers are disengaged and the discs 28 re-set as desired.

Figs. 6 and 7 show a second apparatus according to the present invention. The second apparatus is similar to that shown in Figs. 2 to 5, but with two additional features. In Figs. 6 and 7, a handle 36 rotates a first toothed gear wheel 38, which meshes with a bigger second toothed gear wheel 40 coaxial with the first roller 42 of

the apparatus. The gearing reduction provides easier rotation of the handle 36 relative to the second first roller 42, especially where a blister pack may not progress through the rollers as easily as desired.

The apparatus in Figs. 6 and 7 also has a post deblistering guide means,  
5 comprising two transport blades 44 and a rear flap 46, all moveable along a support bar 48. The front points of the blades 44 lie close to the exit of a deblistered pack, and are designed to pick up and transport the empty pack rearward to a collecting bin beyond the flap 46. The blades 44 and flap 46 may be aligned according to the size and shape of the blister packs being deblistered. Meanwhile, tablets from the  
10 pack fall immediately beyond the second roller 50 into a separate collecting facility. The paths of a blister pack, deblistered pack, and freed tablets are shown in Fig. 6 by arrows A, B and C respectively.

The present invention thus provides a deblistering machine which is capable  
of rapid and varied adjustment for alignment with most if not all of the different  
15 shaped and patterned blister packs used in the world. The discs are easily moveable along their shaft, and may additionally be held in alignment during use by pressure from the first roller.

Variations and modifications can be made without departing from the scope of the invention described above.

1     CLAIMS

2

3     1     Apparatus for extracting articles from a blister  
4           pack comprising first and second opposing  
5           rollers between which the pack is able to pass  
6           for article extraction through pressure from the  
7           rollers, wherein the first roller is wholly or  
8           substantially cylindrical, and the second roller  
9           comprises a shaft having a plurality of  
10          transverse discs therearound, the discs being  
11          separately moveable along the shaft,  
12          characterised in that the discs are not locked  
13          axially of the second roller in use.

14

15     2     Apparatus as claimed in Claim 1 wherein  
16           alignment of the discs during use is maintained  
17           by external or internal pressure thereon.

18

19     3     Apparatus as claimed in Claim 1 or Claim 2  
20           wherein the shaft of the second roller is a  
21           wholly or substantially smooth cylinder.

22

23     4     Apparatus as claimed in Claim 1 or Claim 2  
24           wherein the shaft comprises two or more parallel  
25           elongate parts moveable between a contracted  
26           position for movement of the discs therealong  
27           and an expanded position for securement of the  
28           discs.

29

- 1     5     Apparatus as claimed in Claim 4 wherein one or  
2     more of the parts include outer-facing grooves  
3     or ridges to assist location of the discs.  
4
- 5     6     Apparatus as claimed in Claim 1 or Claim 2  
6     wherein the shaft comprises a spindle having a  
7     plurality of partly or fully circumferential  
8     grooves therealong, each disc being locatable in  
9     one or more grooves.  
10
- 11    7     Apparatus as claimed in Claim 6 wherein the  
12    grooves are relatively shallow compared with the  
13    diameter of the spindle.  
14
- 15    8     Apparatus as claimed in Claim 6 or Claim 7  
16    wherein the grooves are separate.  
17
- 18    9     Apparatus as claimed in any one of Claims 5 to 8  
19    wherein each disc is locatable in one groove.  
20
- 21    10    Apparatus as claimed in any one of the preceding  
22    claims wherein both rollers are rotatable.  
23
- 24    11    Apparatus as claimed in any one of the preceding  
25    Claims wherein the rollers are moveable between  
26    an engaged position and a disengaged non-use  
27    position.  
28
- 29    12    Apparatus as claimed in any one of the preceding  
30    Claims wherein the discs are loose fitting along  
31    the second roller when changing their position.



- 1     13   Apparatus as claimed in any one of the preceding  
2           Claims wherein pressure of the first roller on  
3           the discs of the second roller assists their  
4           securement and alignment during use.  
5
- 6     14   Apparatus as claimed in any one of the preceding  
7           Claims wherein the apparatus includes a blister  
8           pack feed guides.  
9
- 10    15   Apparatus as claimed in any one of the preceding  
11          Claims wherein the apparatus includes a template  
12          as a disc alignment means.  
13
- 14    16   Apparatus as claimed in any one of the preceding  
15          Claims wherein the apparatus includes one or  
16          more post-deblistering guide means to assist  
17          division of the separated articles and the  
18          deblistered packs.  
19
- 20    17   Apparatus as claimed in any one of the preceding  
21          Claims wherein the apparatus is manually  
22          operable.  
23
- 24    18   Apparatus as claimed in Claim 17 wherein the  
25          apparatus includes a handle to manually rotate  
26          one or both rollers.  
27
- 28    19   A method of extruding articles from a blister  
29          pack wherein the pack is passed between first  
30          and second opposing rollers, the first roller  
31          being wholly or substantially cylindrical, and

1 the second roller comprising a shaft having a  
2 plurality of transverse discs separately  
3 thereabouts, the discs being movable along the  
4 shaft and aligned to meet and support the sides  
5 of the wells of the pack to allow pressure  
6 extraction of the articles by the first roller,  
7 characterised in that the discs are not locked  
8 axially of the second roller in use.  
9

10 20 A method of extruding articles as claimed in  
11 claim 19 wherein the first roller or second  
12 rollers or both rollers are manually rotated.